

CLAIMS

What is claimed is:

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1. A method of assembling electrochemical cell components, comprising:  
aligning first and second electrochemical cell components;  
providing a bonding agent between the first and second electrochemical cell components;  
10 placing the aligned components into a container consisting essentially of a pliable bag; and  
drawing a vacuum within the pliable bag, wherein the pliable bag molds to a shape of the aligned components.

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2. The method of claim 1, further comprising:  
applying pressure to the outside of the vacuum bag, wherein the pressure is selected from hydrostatic pressure and pneumatic pressure.

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3. The method of claim 1, further comprising:  
placing the sealed vacuum bag containing the components into an oven.

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4. The method of claim 1, further comprising:  
distributing the bonding agent through one or more closed channels formed between the first and second electrochemical cell components.

5. The method of claim 4, wherein the step of distributing the bonding agent through one or more closed channels further comprises:

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adding the bonding agent into an upward-facing open channel in the bonding surface of the first component;

creating the closed channel when the second component is aligned with the first component; and

inverting the components, wherein the bonding agent flows against the second component by means selected from gravity, capillary action and combinations thereof.

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6. The method of claim 5, wherein the open channel contains a plurality of supports disposed in the open channel, the method further comprises:

B.i.

supporting a section of the second component that covers the open channel;

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supporting the open channel, wherein the first and second components do not deform from pressure exerted by the pliable bag.

B.ii.

7. The method of claim 5, wherein the second component has a plurality of supports protruding from a section that covers the open channel, the method further comprising:

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supporting a section of the second component that covers the open channel,

supporting the open channel, wherein the first and second components do not deform from pressure exerted by the pliable bag.

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8. The method of claim 4, wherein the step of distributing the bonding agent through a channel further comprises:

A.ii.

adding a bonding agent into the closed channel through one or more fill ports, wherein the one or more fill ports are in fluid communication with the closed channel.

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9. The method of claim 8, wherein the bonding agent source is a syringe, pump, or other delivery device having a conduit adapted to form a seal with each of the one or more fill ports, the method further comprising:

injecting a bonding agent into the closed channel from the delivery device.

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10. The method of claim 4, wherein an overflow reservoir is in fluid communication with the closed channel, the method further comprising:

capturing excess bonding agent flowing from the closed channel into the overflow reservoir.

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11. The method of claim 8, wherein the bonding agent source is an open reservoir in one or more of the components, the method further comprises:

pushing the bonding agent into the closed channel with the pliable bag as the vacuum causes the pliable bag to mold to the shape of the reservoir.

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12. The method of claim 11, wherein the reservoir contains a spring pushing against the pliable bag, the method further comprises:

maintaining pressure with the spring against a portion of the pliable bag molding to the shape of the reservoir, wherein the spring limits a speed at which the bonding agent is forced from the reservoir.

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13. The method of claim 11, wherein an overflow reservoir is in fluid communication with the closed channel, the method further comprising:

capturing excess bonding agent flowing from the closed channel into the overflow reservoir.

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14. The method of claim 1, further comprising:

(c) maintaining alignment of the cell components by disposing a bonding agent between the components.

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15. The method of claim 1, further comprising:

treating a bonding surface on the first and second electrochemical cell components to enhance flow of the bonding agent; and

treating a non-bonding surface on the first and second electrochemical cell components to inhibit flow of the bonding agent.

16. The method of claim 15, wherein the step of treating a bonding surface  
5 comprises a process selected from applying a wetting agent, polishing, etching and combinations thereof.

17. The method of claim 15, wherein step of treating a bonding surface comprises  
10 applying a wetting agent selected from detergents, soaps, surfactants, anionic, and cationic surface active compounds.

18. The method of claim 15, wherein the step of treating a non-bonding surface  
15 comprises a process selected from roughening, chemically modifying, coating, and combinations thereof.

19. The method of claim 1, further comprising:  
providing a feature along an interface between the first and second  
electrochemical cell components and between a bonding area and a non-bonding area;  
retaining and confining excess bonding agent to the region bounded by the  
20 features to prevent the bonding agent from reaching the non-bonding area.

20. The method of claim 1, wherein the pliable bag is made of a material selected  
from polyethylene and a nylon-polyethylene blend.

21. The method of claim 20, wherein the pliable bag has a thickness of between  
25 about 2 mils and about 7 mils.

22. The method of claim 1, wherein the step of sealing the bag further comprises  
melting unsealed edges of the bag together.

23. The method of claim 1, wherein the step of sealing the bag includes hermetically sealing the bag.

5 24. The method of claim 1, wherein the first and second components are placed in the pliable bag without an alignment frame.

25. The method of claim 1, wherein the vacuum inside the sealed bag is maintained without maintaining a connection to a vacuum source.

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26. The method of claim 1, further comprising:  
sealing the bag to retain the vacuum within the bag; and  
maintaining the vacuum within the bag.

15 27. A subassembly of electrochemical cell components, comprising:  
a first component having a first bonding surface with one or more open channels, wherein the one or more open channels contain a bonding agent; and  
a second component having a second bonding surface aligned with the first bonding surface of the first component.

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28. The subassembly of claim 27, further comprising:  
A a plurality of supports disposed within the one or more open channels, wherein the supports prevent the atmospheric or applied external pressure from deforming the first component or the second component along the one or more open channels.

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29. The subassembly of claim 27, further comprising:  
A a plurality of supports extending from the second bonding surface, wherein the supports extend into the one or more open channels when the second bonding surface aligns with the first bonding surface, and wherein the supports prevent the pressure

differential from deforming the first component or the second component along the one or more open channels.

30. The subassembly of claim 27, further comprising:

- 5       a bonding agent delivery reservoir in fluid communication with the one or more channels; and  
      a bonding agent disposed in the reservoir.

31. The subassembly of claim 30, wherein the bonding agent reservoir is adapted to  
10   expose the bonding agent to externally applied fluid pressure.

32. The subassembly of claim 31, further comprising:

- an overflow reservoir in fluid communication with an opposing end of the one or more channels from the bonding agent reservoir.

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33. The subassembly of claim 27, further comprising:

- opposing bonding surfaces on the first and second electrochemical cell components, wherein the bonding surfaces have been treated to enhance flow of the bonding agent; and  
20       opposing non-bonding surfaces on the first and second electrochemical cell components, wherein the non-bonding surfaces have been treated to inhibit flow of the bonding agent.

34. The subassembly of claim 33, wherein the bonding surfaces have been treated  
25   by a process selected from applying a wetting agent, polishing, etching and combinations thereof.

35. The subassembly of claim 33, wherein the non-bonding surfaces have been treated by a process selected from roughening, chemically modifying, coating, and combinations thereof.

5 36. The subassembly of claim 33, wherein at least one of the non-bonding surfaces is coated with polytetrafluoroethylene (PTFE) or perfluoroalkoxy (PFA).

37. The subassembly of claim 27, further comprising one or more features disposed along an interface between the first and second components to confine adhesive  
10 flowing from the bonding surfaces towards a non-bonding surface.

38. The subassembly of claim 27, wherein the bonding surfaces have a plurality of surface features.

15 39. The subassembly of claim 38, wherein the surface features are micro grooves.

40. The method of claim 1, further comprising:  
maintaining the vacuum within the bag until the bonding agent has cured.

20 41. The method of claim 1, further comprising:  
(c) maintaining alignment of the cell components by interlocking one or more feature between the first and second cell components.

42. The method of claim 41, wherein the one or more interlocking feature is a pin.

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43. The method of claim 14, wherein the bonding agent is a contact adhesive.

44. The <sup>subassembly</sup>(method) of claim 27, wherein the bonding agent is a contact adhesive.

45. A method of assembling electrochemical cell components, comprising:  
aligning first and second electrochemical cell components;  
providing a bonding agent between the first and second electrochemical cell components;
- 5 placing the aligned components into a pliable bag,  
placing the pliable bag within a vacuum chamber; and  
drawing a vacuum on the vacuum chamber.
46. The method of claim 45, further comprising:
- 10 sealing the bag to retain the vacuum within the bag; and  
removing the sealed bag from the vacuum chamber, wherein the pliable bag  
molds to a shape of the components.
47. The method of claim 45, further comprising:
- 15 maintaining the vacuum inside the sealed bag.
48. The method of claim 46, further comprising:  
maintaining the vacuum until the bonding agent has cured.